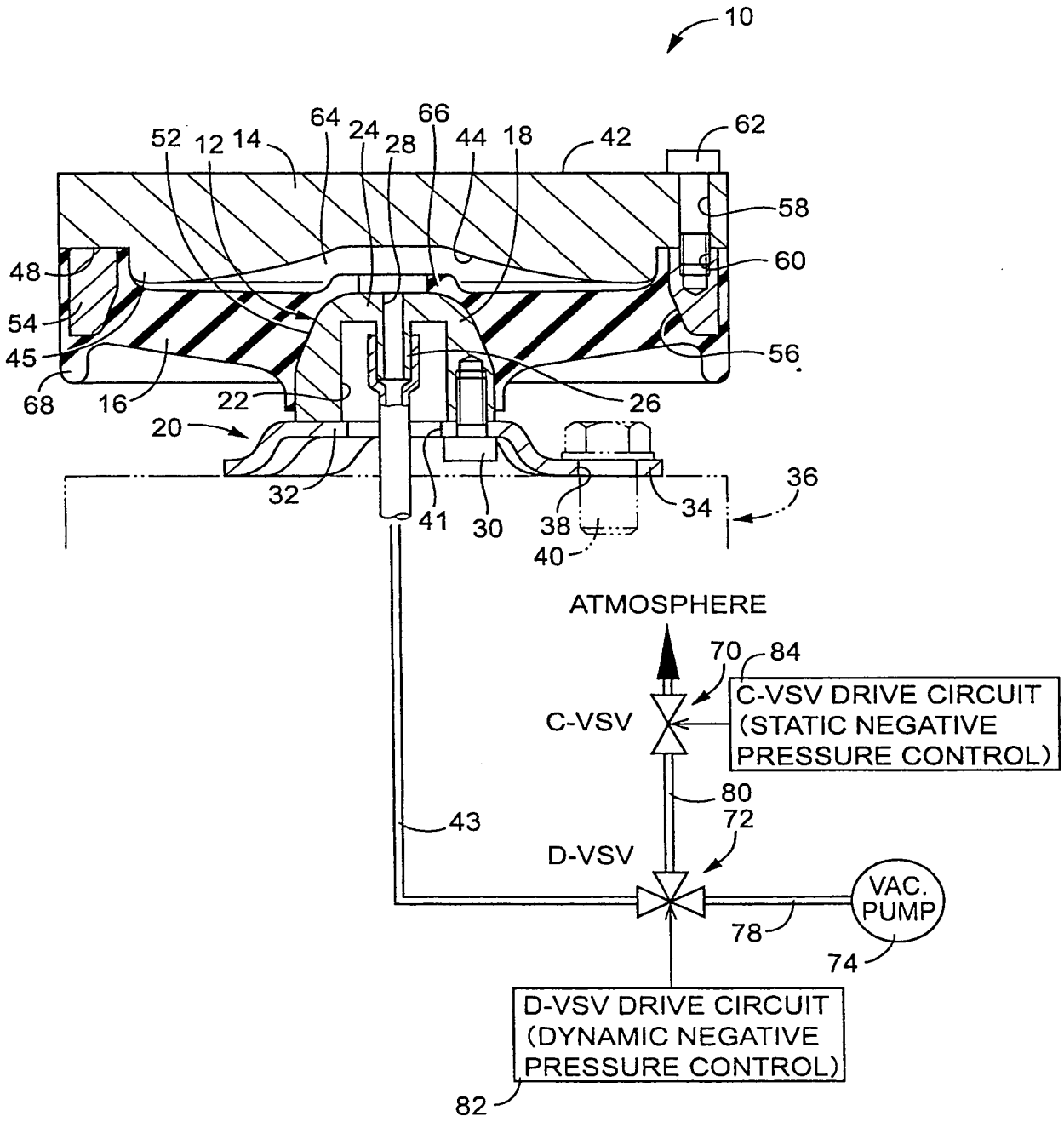
FIG. 1


10
52
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64
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45
56
68
16
22
26
20
32
41
30
38
34
36
40
ATMOSPHERE
70
84
C-VSV
C-VSV DRIVE CIRCUIT (STATIC NEGATIVE PRESSURE CONTROL)
80
43
72
D-VSV
VAC. PUMP
78
74
D-VSV DRIVE CIRCUIT (DYNAMIC NEGATIVE PRESSURE CONTROL)
82

FIG. 2

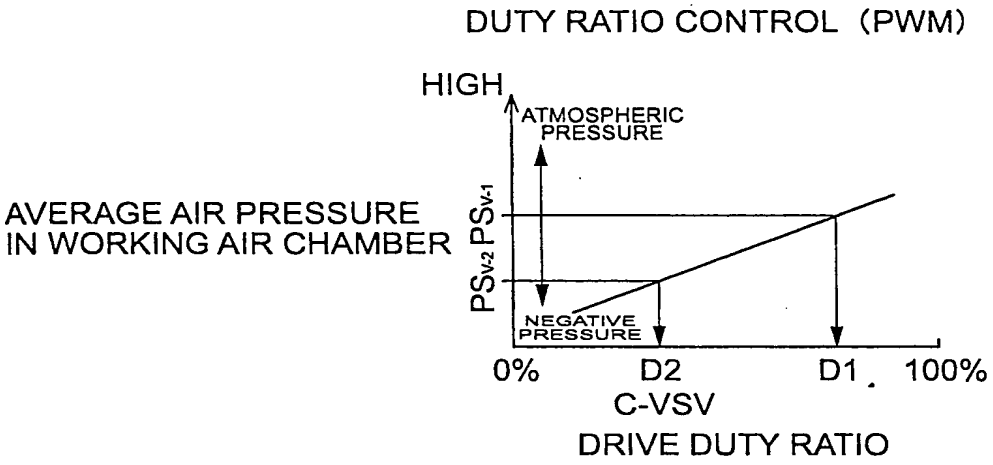

DUTY RATIO CONTROL (PWM)
HIGH
ATMOSPHERIC PRESSURE
AVERAGE AIR PRESSURE IN WORKING AIR CHAMBER
PSv-1
PSv-2
NEGATIVE PRESSURE
0%
D2
D1
100%
C-VSV
DRIVE DUTY RATIO

FIG. 3

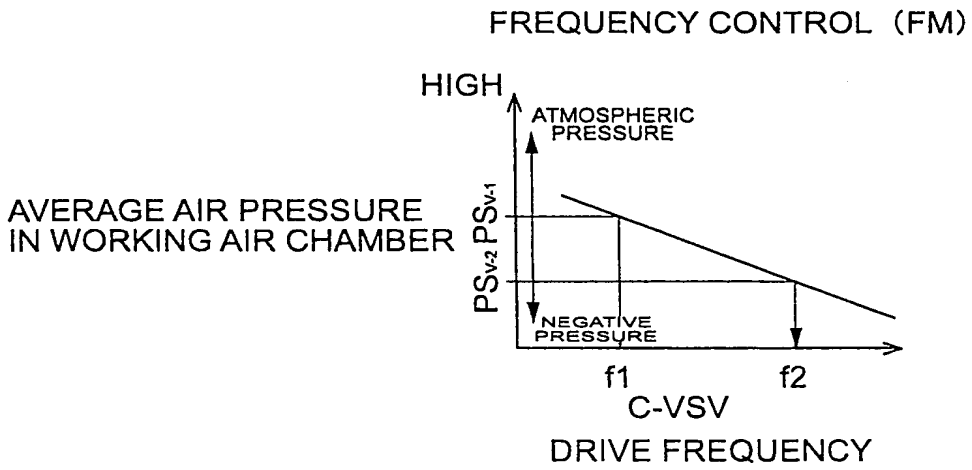
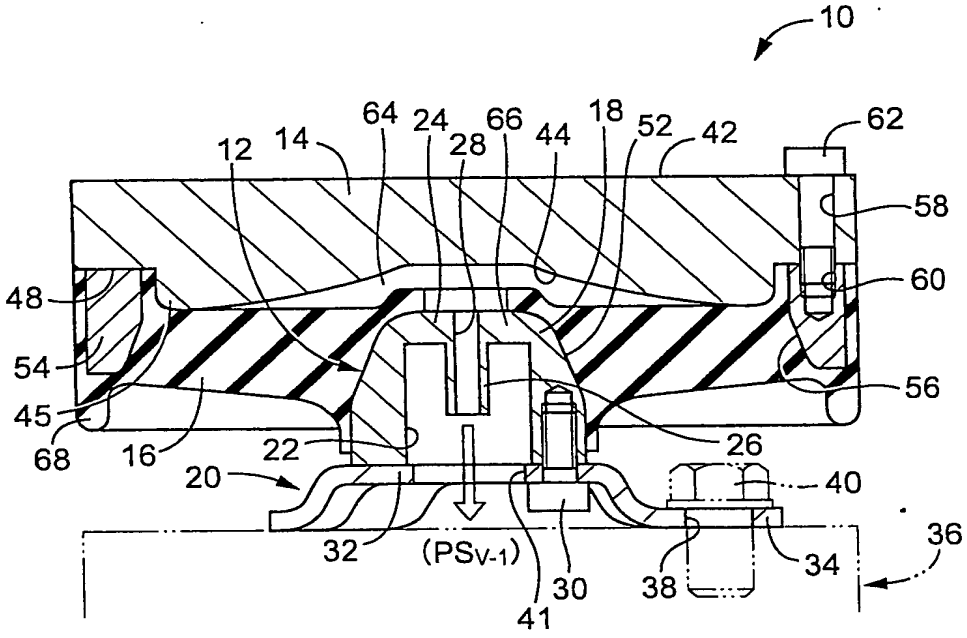

FREQUENCY CONTROL (FM)
HIGH
ATMOSPHERIC PRESSURE
AVERAGE AIR PRESSURE IN WORKING AIR CHAMBER
PSv-1
PSv-2
NEGATIVE PRESSURE
f1
f2
C-VSV
DRIVE FREQUENCY

FIG. 4


10
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18
52
42
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12
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28
44
58
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68
16
22
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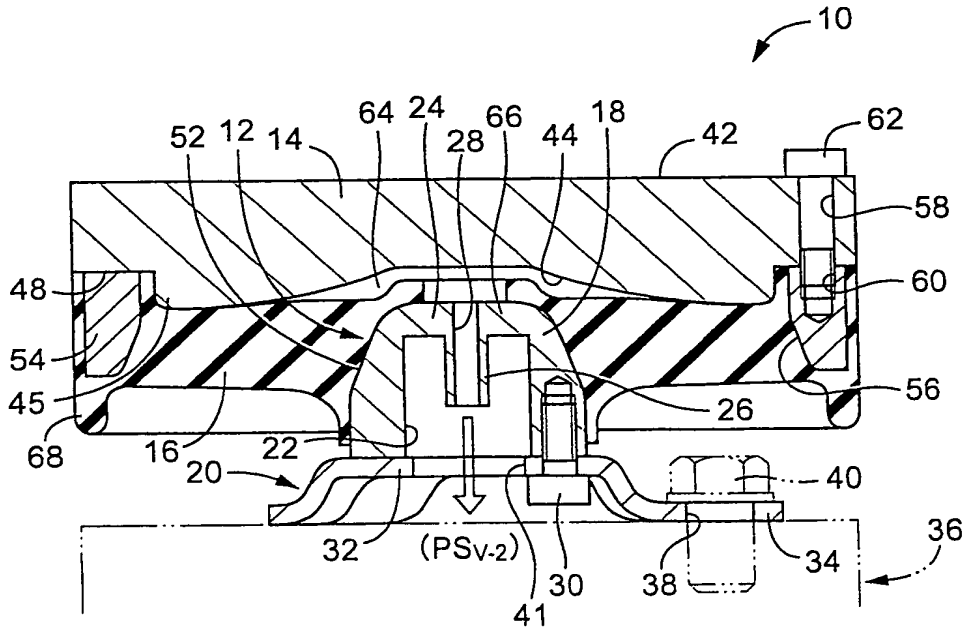
20
40
32
(PSV-1)
30
38
34
36
41

FIG. 5


10
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45
26
68
16
22
20
40
32
(PSV-2)
30
38
34
36
41

FIG. 6

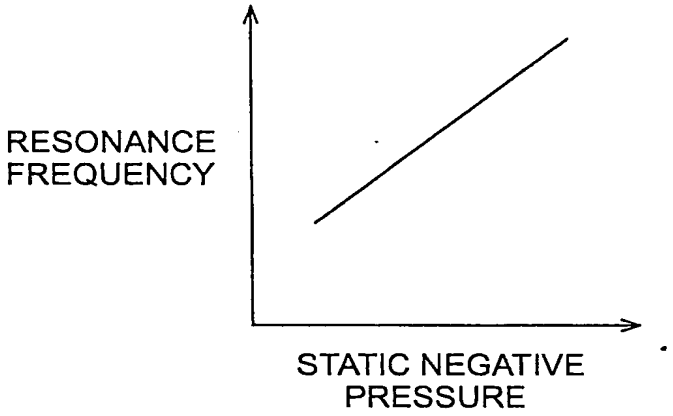

RESONANCE
FREQUENCY
STATIC NEGATIVE
PRESSURE

FIG. 7

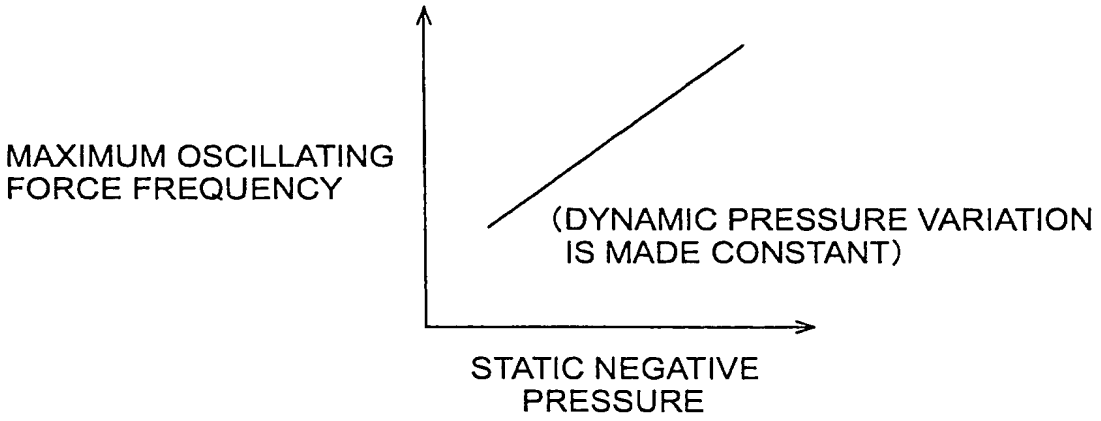

MAXIMUM OSCILLATING
FORCE FREQUENCY
(DYNAMIC PRESSURE VARIATION
IS MADE CONSTANT)
STATIC NEGATIVE
PRESSURE

FIG. 8

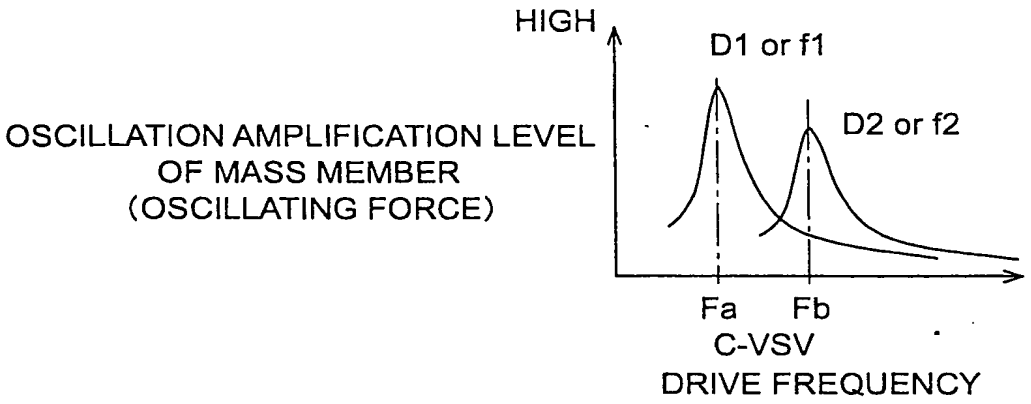

HIGH
OSCILLATION AMPLIFICATION LEVEL
OF MASS MEMBER
(OSCILLATING FORCE)
D1 or f1
D2 or f2
Fa
Fb
C-VSV
DRIVE FREQUENCY

FIG. 9

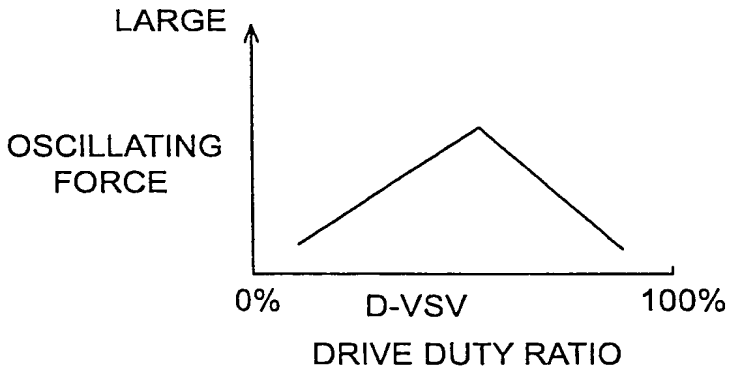
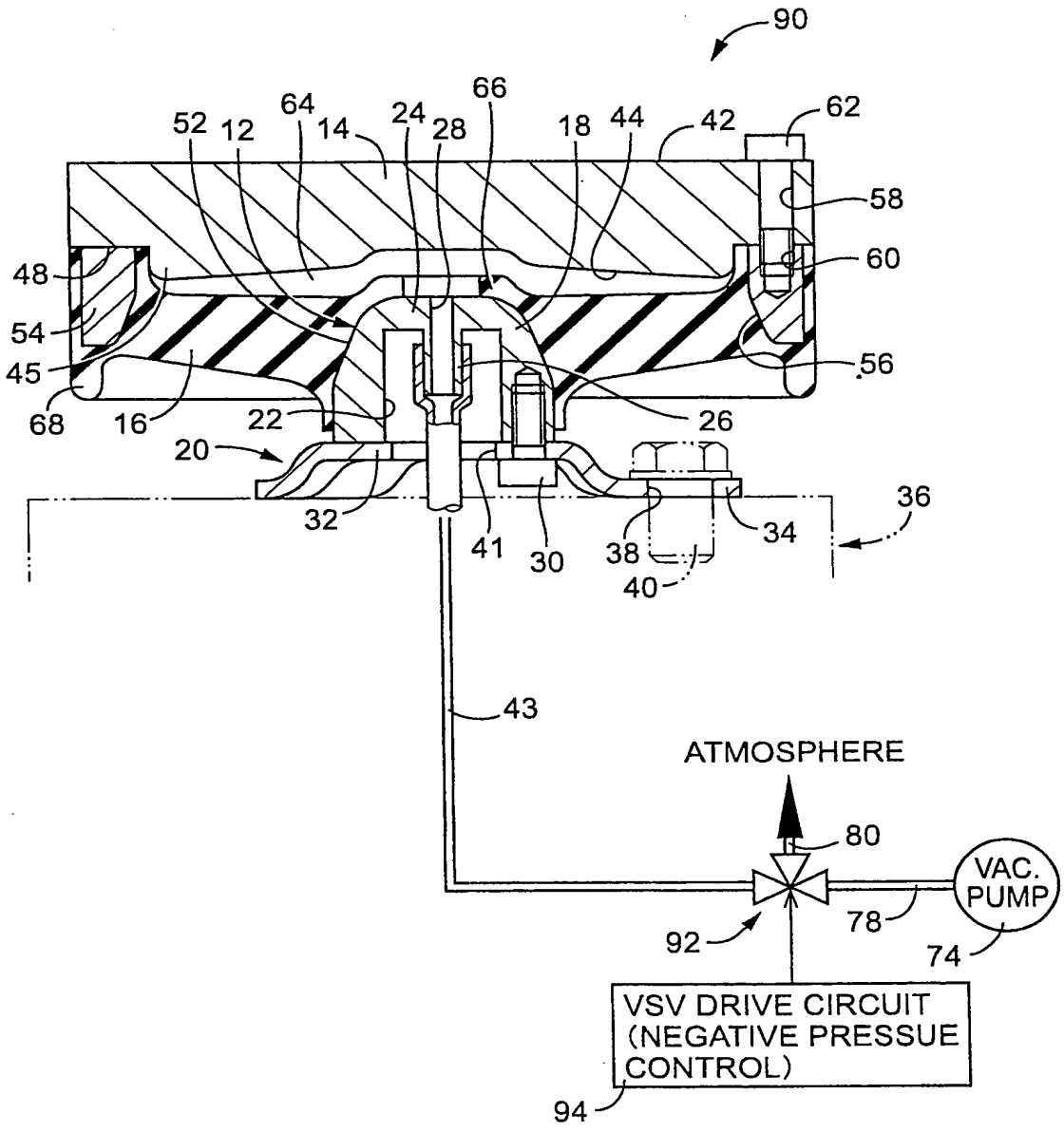

LARGE
OSCILLATING
FORCE
0%
D-VSV
100%
DRIVE DUTY RATIO

FIG. 10


90
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48
54
45
56
68
16
22
26
20
32
41
30
38
34
36
40
43
ATMOSPHERE
80
VAC. PUMP
78
74
92
VSV DRIVE CIRCUIT (NEGATIVE PRESSUE CONTROL)
94

FIG. 11

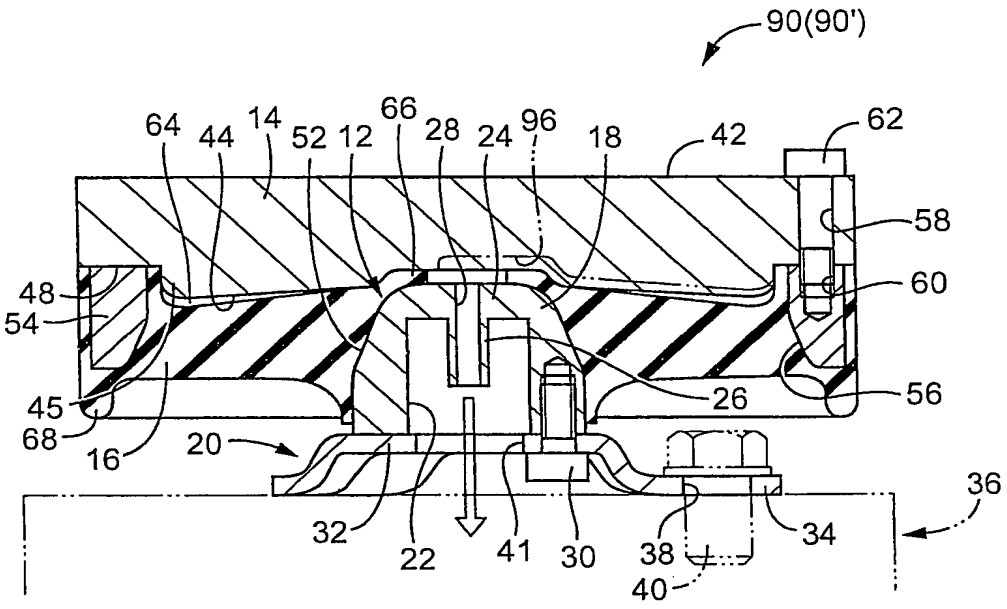
90(90')
64
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FIG. 12

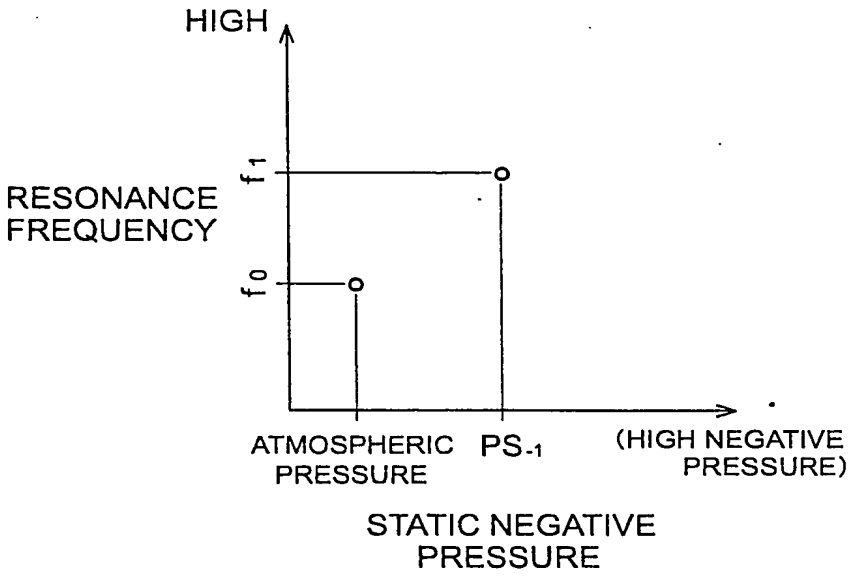
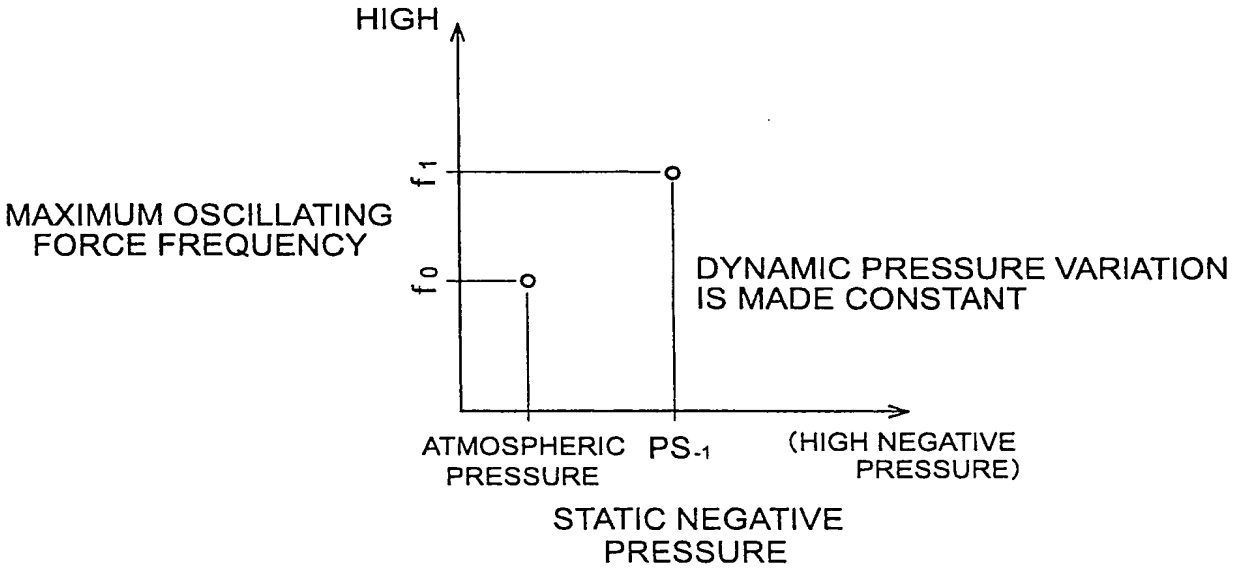

HIGH
RESONANCE FREQUENCY
$f_1$
$f_0$
ATMOSPHERIC PRESSURE
$PS_{-1}$
(HIGH NEGATIVE PRESSURE)
STATIC NEGATIVE PRESSURE

FIG. 13


HIGH
MAXIMUM OSCILLATING FORCE FREQUENCY
$f_1$
$f_0$
DYNAMIC PRESSURE VARIATION IS MADE CONSTANT
ATMOSPHERIC PRESSURE
$PS_{-1}$
(HIGH NEGATIVE PRESSURE)
STATIC NEGATIVE PRESSURE